National Security Education Center

A CONSORTIUM OF LANL INSTITUTES

Information Science and Technology Center Seminar

Peter C. Doerschuk
Biomedical Engineering
Electrical and Computer Engineering

"Statistical Inference for Dynamical Structural Biology"

Wednesday, May 19, 2010
3:00 - 4:00 PM
TA-3, Bldg. 1690, Room 102 (CNLS Conference Room)

Abstract: Understanding macromolecular complexes such as viruses and ribosomes as nano-scale machines is an important goal of structural biology. The emphasis on machines implies an emphasis on temporal dynamics. Cryo electron microscopy is an important methodology for studying such complexes, especially in the case where crystals are not available, and the resulting images have low signal to noise ratios. Therefore, variability in the data can be attributed to multiple sources, dynamics or noise. A statistical inference approach which attempts to separate dynamics from noise and provide a mechanical model of the complex will be described and the first steps toward numerical results will be presented.

Biography: Peter Doerschuk's research concerns biological and medical systems from the viewpoint of computational nonlinear stochastic systems. In particular, he has contributed to computational inverse problems for biophysics, statistical image processing, and biomedical and speech signal processing. In each of these areas, important goals of his work have been to incorporate accurate physical models while at the same time developing computationally practical algorithms implemented in high-performance software systems.

A wide range of spatial and temporal scales is represented in his research. At the smallest spatial scale, in collaboration with Professor J. E. Johnson (The Scripps Research Institute), he has developed algorithms and parallel software for problems associated with determining the 3-D shape of viruses from electron microscopy images and x-ray scattering data. Parallel software has played a critical role in solving these problems. At the largest spatial scale, in collaboration with Professor S. J. O'Connor (Indiana University School of Medicine), he has developed nonlinear differential equation models of the pharmacokinetics of ethanol. He has used these models to develop signal processing and pattern recognition algorithms and software for processing the outputs of a long-term implanted ethanol sensor system and to determine parameters describing the ethanol-related physiology of an individual from breath ethanol measurements.

On January 1, Peter Doerschuk began a five-year term as Associate Editor for the IEEE Transactions on Image processing which is a leading journal in the area of signal-processing aspects of image processing, imaging systems, and image scanning, display, and printing. The focus of his editorial activities is medical and biological imaging manuscripts.

Before joining Cornell University in July 2006, Peter Doerschuk was on the faculty of Purdue University in Electrical and Computer Engineering and Biomedical Engineering. He received BS, MS, and Ph.D. degrees in Electrical Engineering from MIT and an M.D. degree from Harvard Medical School. After post-graduate training at Brigham and Womens' Hospital he held a post-doctoral appointment at the Laboratory for Information and Decision Systems (MIT) before joining Purdue.

Los Alamos NATIONAL LABORATORY EST.1943

Contact the technical host Frank Alexander, fja@lanl.gov, 665-4518 for further information.
——Hosted by the Information Science and Technology Center (ISTC)——